Note.—The application for a Patent has become void.

This print shows the Specification as it became open to public inspection on March 19, 1936, under Section 91 (4) (a) of the Patents and Designs Acts, 1907 to 1932.

PATENT SPECIFICATION

453,217

Application Date: Dec. 1, 1934.

No. 34531/34.
No. 34532/34.
No. 34533/34.
No. 34534/34.
No. 34535/34.
No. 34536/34.
No. 34537/34.
No. 34538/34.
No. 34539/34.
No. 34540/34.

(One Complete Specification Left under Section 91 (2) of the Acts)

Specification not Accepted

COMPLETE SPECIFICATION

Improvements in and relating to Spigot and Socket Joints

I, HANS KAATZ, of 98, Karolingerstrasse, Düsseldorf, Germany, a citizen of the German State, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Spigot and socket joints are known in which the ends of the tubes are held together by a screw-threaded ring provided on the end of the spigot and which engages in a screw thread on the socket. In these joints the end of the spigot is prevented from leaving the socket by the provision of a projection on the end which extends through the screw-threaded ring. Between the projection and the base metal of the socket packing is provided, which is compressed by the tightening of the screw-threaded ring. This construction of joint has the disadvantage that the packing is capable of penetrating into the tube and so causing the cross-sectional area to be reduced, as well as causing eddies and rendering valves in the tube useless because of pieces of the packing being washed off.

These disadvantages do not occur in other constructions. Thus, for example, a joint is known in which to prevent the packing from penetrating into the tube the spigot is brought close up to the end of the socket. This joint has, however, a different but very considerable disadvantage—namely, that the end of the spigot is held solely by the packing. The inserted end of the tube is capable of axial movement in accordance with the elasticity of the packing. A rigid joint is not obtained. Furthermore, the packing is unduly stressed when there is movement. As compared with this, the spigot and socket joint according to the invention is absolutely rigid and therefore answers perfectly.

A rigid spigot and socket joint is known in which the spigot has its end pressing against the base of the socket, while at the same time it is protected against withdrawal by reason of the fact that it is held by an extension against a multipartite conical ring, which in turn presses against a correspondingly wedge-shaped multipartite ring held against the conical wall of the socket. This construction, however, has the disadvantage that on account of its being constituted of several parts it is very difficult to assemble, while it is almost impossible to take the pieces apart. Furthermore, the actual packing is not housed in a closed chamber, so that it is not effectively prevented from falling out, nor can it be compressed to predetermined measurements as is the case with the joint according to the invention.

All the disadvantages before referred to are avoided, in the provision according to the invention of a spigot and socket joint in which the ends of the tubes are held together by a screw-threaded ring provided on the end of the spigot and engaging in a screw thread on the socket by the screw-threaded ring pressing against a projection at the end of the spigot, and the latter abutting against the bottom of

the socket for preventing axial movements and so forming a hollow chamber shut off from the inside of the tube, packing being provided in the hollow chamber. At the same time, according to the invention the packing is provided at the rear of the projection at the end of the tube, whereby the packing is prevented from being damaged when the screw-threaded ring is screwed in. Furthermore, according to the invention a locking ring may be provided between the projection and the screw-threaded ring. It will be understood that the projection provided according to the invention may be formed in different ways; for instance, it may be produced by providing the end of the spigot with a sleeve, against which the screw-threaded ring presses with its end edge, or with a stop or the like provided for the purpose. On the other hand the projection may consist in duplicating, or providing a flange on the end of the spigot, or it may consist of a shoulder secured to the end of the spigot or integral therewith, as, for example, by upsetting. In order to facilitate the screwing-in of the screw-threaded ring it is further proposed according to the invention to provide between the projection and the screw-threaded fixing ring a material that reduces friction, such as rollers, balls, lubricant or the like. In all cases it may be advantageous to produce the screw-threaded ring in two or more parts.

The invention is more particularly applicable in connection with forged iron tubes and gas pipes. It is not, however, limited to them but can be used on pipes of cast iron.

According to the invention a particularly useful construction is that in which the projection formed by the flange and against which the screw-threaded ring presses, is provided between the packing and the screw-threaded ring. The advantage of this is that when the screw-threaded ring is screwed in, the packing is effectively prevented from being damaged.

Furthermore, it is possible to join the rigid spigot and socket joint according to the invention, to an expanding shaft.

It will be understood further that the screw-threaded ring may be replaced by a coupling nut, which is an advantage in-so-far as the thread on the external face of the socket may be provided of fine gauge.

By providing the packing chamber wedge-shaped towards the bottom of the socket, the packing can be very tightly compressed in the packing chamber.

The ring to be screwed into the socket may be integral, or it may be divided in a line parallel to the axis of the tube. If the ring is used in its undivided form, it must be slipped over the tube before the projection is provided on the end of the spigot. The screw-threaded ring thus remains on the tube whatever the purpose to which the tube is put. Such purposes, to which belong inter alia the immersion of the tubes in an insulating bath containing bitumen, the winding of the tubes in impregnated jute or bitumen tapes running through an insulating substance, the frequently rough handling of the tubes when they are loaded and unloaded, may easily lead to the screw-threaded ring being rendered unfit for further use. To avoid this an undivided screw-threaded ring is used according to the invention having an open hole that is larger than the projection on the end of the spigot the screw-threaded ring pressing over a divided interposed ring against the projection on the end of the spigot. In this construction the screw-threaded ring does not require to be pushed over the projection on the end of the spigot until the tubes have arrived at the plate where they are to be joined together, that is to say when the tube as such as been made and the troubles of conveyance to where it is to be used have been overcome. The use of a divided ring has the advantage over a divided screw-threaded ring that the divided ring is less expensive to manufacture and simpler to handle as a divided screw-threaded ring must be constructed with greater exactness.

In a modification of the invention it is proposed to provide the interposed ring with a centering extension by which the ring is guided in the screw-threaded ring. This provides a lighter construction. The interposed ring may be further located by means of a centering extension provided near the socket.

In the advantageous construction hereinbefore referred to, in which the projection is produced by making a flange while at the same time protecting the packing from the action of the screw-threaded ring, this projection is of such dimensions that it corresponds approximately to the height of the packing chamber. By this means the packing chamber is completely enclosed and so the material forming the packing is protected in the best possible manner from external influences. This advantage however involves a disadvantage in-so-far as it is difficult at a later date to repack the joint. To remove these disadvantages it is proposed according to the invention to provide between the projection on the

end of the spigot and the inside wall of the spigot an annular chamber for the introduction of packing when it is required to repack the joint, the annular chamber being closed by a suitable extension of the divided interposed ring. In this case when it is desired to repack the joint it is merely necessary to unscrew the screw-threaded ring or the coupling nut and to withdraw the divided interposed ring. Thereupon additional packing may be conveniently rammed in through the annular chamber, the packing being replaced under the compression required by the extension of the reinserted interposed ring in the use of the coupling nut or the screw-threaded ring.

In a further modification of the invention it is proposed to form the extension of the divided interposed ring as a centering extension in such manner that when the ends of the tubes meet there is a centering ring there all ready before the connection is made.

As in repacking it is advantageous to add only that amount of packing as will be sufficient for the interposed chamber which is filled by the extension of the interposed ring; it is further proposed according to the invention to allow the extension to project into the packing chamber beyond the width of the flange in order to make it possible to insert at once a correspondingly larger quantity of packing when making a single refilling or packing. As the tape of jute which has been soaked in tar or bitumen for the further insertion of the joint makes it difficult to wind around irregularities of surface, care must be taken that sudden changes in the annular cross-section are avoided. Particularly important is it that the change from the screw-threaded ring or coupling nut to the end of the tube shall not be a sudden one, indeed the height of the screw-threaded ring or of the coupling nut is increased by the divided interposed ring.

To remove these disadvantages it is proposed according to the invention to taper off the screw-threaded ring or the coupling nut and advantageously also the divided interposed ring in such manner that there is a smooth transition from these parts to the tube for the further insulation.

In a further modification of the invention it is proposed to cover an expanding shoulder provided on the end of the socket with the end of the spigot and to press the projection over a divided distance ring against the bottom of the socket. Covering the expanding shoulder has the advantage that the formation of eddies is avoided.

In order that the expanding shoulder shall remain fully effective, that is to say, the tubular body which is behind the expanding shoulder may be capable of axial movement without destroying the covering, the extreme end of the spigot should not abut against the corresponding part of the other end of the tube. In order that, notwithstanding this, a rigid joint shall be maintained there is pivoted on the end of the spigot a divided distance ring or a second projection which presses on the bottom of the socket. If a divided distance ring be used it is tapered down according to the invention towards the flange side of the end of the spigot so that it does not damage the packing in front of it on insertion.

In order to provide the spigot and socket joint of spherical shape and capable of being moved it is furthermore proposed to provide of spherical form the end of the spigot pressing against the bottom of the socket as well as the bottom of the socket, the projection on the side facing the interposed ring and the side of the interposed ring adjoining the side referred to. The end of the spigot abutting against the bottom of the socket is made spherical in shape by flanging, doubling, or upsetting, or in some similar manner. The projection is advantageously in the form of a divided ring and is fixed a certain distance away in the direction of the bottom of the socket, the compression space for the packing being determined by the distance away.

The divided interposed ring, which also is spherical on the side facing the projection, prevents the end of the spigot facing the end of the socket moving axially after the parts forming the joint have been screwed together. The forces generated in the interposed ring are liberated by setting the interposed ring according to the invention against the inner wall of the socket and by forming a dove-tailed joint in the coupling nut on the pressure transmission extension. In this way the forces exerted at right angles to the axis of the tube are absorbed in the interposed ring although the latter comes to lie at a certain distance, necessary for enabling the tube to move out of axial alignment, from the end of the spigot. In order to avoid acute angles the interposed ring is tapered in the direction of the spherical surface, in order that the forces which become operative when the interposed ring is safely driven in by the sloping spherical surface of the projection shall

not result in jamming.

A further modification of the spigot and socket joint for use with high pressures (about 100/200 atmospheres) as occur particularly in hot steam pipes and chemical processes, consists according to the invention in strengthening the walls of the compression chamber for the packing, so that it is possible to obtain a much higher pressure in the packing in the compression chamber than does exist in the pipe.

The strengthening of the walls consists firstly in thickening the wall of the socket, but principally in thickening the end of the spigot, which limits the compression space in the direction of the inside of the tube. This end of the spigot is according to the invention strengthened by doubling the thickness of the tube.

A spigot and socket joint provided according to the invention renders possible the use of very cheap materials as packing. In a very large percentage of all spigot and socket joints hitherto employed lead is essential and in one particular case a very considerable percentage of rubber is necessary. These substances are expensive—for example a rubber ring for a tube of the diameter of 150 cm. costs as much as ten Marks, whereas the materials proposed according to the invention cost only a few pfennigs. A further particular disadvantage of a lead packing consists in the fact that such a packing involves high cost of manufacture and its life is dependant upon the care taken in its use. The reason that the packings proposed according to the invention are useful is that in the spigot and socket proposed according to the invention there is a complete elimination of axial movement so that the packing cannot be reduced to powder by rubbing. The packing is actually seated in a hollow space completely shut off from the inside of the tube; this hollow space may as compression space be of such dimensions that the packing is compressed to an extent which corresponds to the nature of the material and to the degree of compression necessary.

The following substances are suggested as packing material: products of bitumen interspersed by fibrous substance or without any fibrous substance at all; packing of hemp or packing of flax and graphite, packing of hemp or vegetable fibre soaked in oil; metallic and non-metallic wool; asbestos and like substances; paper or like substance; all of which may for example be in the form of rope. These substances may be used either prepared or in a raw state. According to whether the medium passing through the tubes is water, gas, petroleum, benzene, benzine, or even agents containing salt or acid, one or more of the substances enumerated, are preferably selected, the tubes being lined with a corresponding material. Thus, for water, suitable substances are products of bitumen, packings of hemp or vegetable fibre soaked in oil, paper or like substances; for gas, hemp or flax soaked for example in minium (Pb_3O_4); for steam, packing of hemp or flax and graphite, or asbestos and like substances; for petroleum benzene, benzine, metallic and non-metallic wool; for agents containing salt and acid, non-metallic wool such as glass wool.

The invention is also applicable to the inexpensive turning of the screw thread on the socket. Hitherto in the case of screw-threaded sockets of steel the thread has been produced exclusively by milling. To reduce the cost of these various materials it is proposed to form the thread by rolling, that is to say in the same heat as that in which the pressing of the socket is carried out. Before the thread is produced by rolling the socket may furthermore be lightly heated as for example by means of a gas flame.

Apparatus for carrying out the method is provided according to the invention which is characterised by forming in the shape of a barrel one or more screw-threaded rollers working on the compound metal and of a section corresponding to the pitch and form of the thread. Such rollers are suitable for removing by forging irregularities on the surface of the socket and for forging the complete thread in the rolling operation. Furthermore the apparatus consists in employing as abutment for the thread producing rollers the head of the mandrel used for pressing, the socket, the head being rotatably mounted. The drive for the rollers and movement in the axial direction can be effected either by means of the tube or by means of the rollers.

It will be understood that the method according to the invention can be employed if the thread is to be cut on the inside of the socket. In this case the mandrel acting as abutment is replaced by one carrying thread producing rollers, while the matrices surrounding the socket during pressing serve as abutment during the rolling of the thread.

Very considerable forces are, however, necessary for producing the thread by rolling; these forces at the same time produce rapid wear on the apparatus required for carrying out this method for example on the bearings of the

thread-producing rollers. With a view to producing an improvement it is further proposed according to the invention first of all to press the thread in the socket. This can be carried out at the same time as the socket is pressed out. To avoid the burr which forms between the abutting positions of the swages and which is also produced on the screw-thread during the pressing operation it is further proposed to submit the socket to a second pressing in a position which is staggered with respect to the position assumed in the first working operation for example at an angle of 45°.

It is furthermore proposed according to the invention to provide a device in which the swages receive the shape of the socket and thread at the same time. In this connection the swage part of the thread extends beyond the screw-threaded length of the socket. This is necessary if the socket is staggered in the swage as movement in the axial direction towards the smooth end of the tube is impossible because of the shape of the socket. Furthermore the mandrel producing the internal shape of the socket is provided with a flange for upsetting the blank for the complete pressing of the thread.

A second proposal for improving the method of rolling the screw-thread consists in first milling the thread in the hot state. The invention is based upon the idea of obtaining for the product (applicable to the work) Power × Path a reduction in the " power factor " by increasing the " path factor ". Whereas during the rolling of the thread the roller is rotating at the same speed as the socket, the milling tool has a much higher peripheral speed than the tubular socket. In addition thereto the blank is machined while in the hot condition which needs less power because of the low resistance which the raw material has in this condition. It is proposed to carry out the milling operation by means of a thread tool which is provided with a barrel-shaped cutting part or a cylindrical milling part with a taper for smoothing down the irregularities on the surface of the socket.

It is further proposed according to the invention to mill the thread in steps. The milling tool sections are for the purpose divided into a number of steps and are arranged one behind the other while maintaining a distance from a screw-thread path, while at the same time between the sections cylindrical parts are employed for removing the burr which may be produced during the milling in the hot. A further proposal consists in completely milling the thread during one rotation of the socket. For this purpose a single roller accommodates a number of milling sections side by side.

The essential feature of the invention is, as will be understood, in no way affected by the fact that the milling or pressing in the swage, is employed exclusively for producing the thread and therefore that the milling or pressing is not used as a preliminary to the rolling of the thread.

It will be understood that the feeding movement during the milling must naturally correspond to the pitch of the thread.

In the ordinary tube ends produced with a pilgering head the thickened parts for the sockets—which are necessary more especially because of the thread to be cut in the socket—are already present when the tube is being made. In the case of passes in which the pilgering head is cut off, or in the case of tubes produced by other methods such thickened parts are not however present; this also applies in connection with the short sections of tubing usually employed for the production of mould parts. In order to produce the thickened parts necessary for the screw thread it is proposed according to the invention to use sleeves—known as " false sockets "—applied to the socket. As the tensional forces are transmitted through the screw thread, the sleeves referred to must be specially prevented from making axial movement. For the purpose it is provided according to the invention that the sleeves be welded to the tube, for example, on the end faces of the sleeve or by hole welding or spot welding. The same effect is obtained by flanging the tube at suitable positions. The sleeves together with the wall of the tube are made of the same shape as the socket.

It is of little importance to the invention whether the sleeve is applied to the outside of the socket or to the inside. What is important is to thicken the wall of the tube at the end of the socket which may be effected, for example, by upsetting.

It is furthermore proposed according to the invention to upset or in any other way to thicken the sleeve at the position at which the thread is provided for the easier and more simple cutting through of the thread.

A further proposal according to the invention consists in differently forming the wedge surfaces embodied in the thread of the socket and the screw-threaded ring or the coupling nut. According to the invention a bipartite

coupling cap with conical faces lies against the socket and/or against a two-part interposed ring in such manner that when the two-parts of the cap are drawn together by means of screws or wedges a compressive force is exerted on the two ends of the tube. The thread is thus replaced by conical faces, so that the coupling cap need no longer be rotated but its two parts must be drawn together. Thus the forming of a thread on the outer surface of the socket, which may readily be damaged, is avoided.

Constructional examples of the spigot and socket joint according to the invention are diagrammatically illustrated in section in Figures 1 to 13 of the accompany drawings.

Figures 14 to 18 illustrate the method of producing the screw thread and Figures 19 to 23 show the sleeve (known as " false socket ") mounted in position.

In all the Figures, 1 is the screw-threaded socket, 2 is the screw-threaded ring or the coupling nut, and 3 is the end of the spigot.

In Figures 1 and 2 the projection is formed by a swelling 4, against which according to Figure 1 the end edge of the screw-threaded ring 2 presses while according to Figure 2 the screw-threaded ring is provided with a suitably shaped stop 5 which presses against the swelling 4. In Figure 3 the projection is formed by the folded-back parts 6 of the wall of the spigot 3. In this Figure, 7 is a locking ring the purpose of which is to prevent the sliding out of the end of the spigot while at the same time the pressure on the packing 8 can be increased to any extent desired by tightening the screw-threaded ring 2. In Figure 4 the projection is formed as a flange 9, while in Figure 5 it consists of a shoulder 10. According to Figure 6, the packing 8 is provided to the rear of the flange 9, thus effectively preventing damage during the screwing-in of the screw-threaded ring 2. 11 is a known expansion corrugation in the spigot. Between the flanges 9 and the screw-threaded ring 2 and, where required, also in all other of the constructions hereinbefore described according to the invention a friction reducing substance is advantageously introduced such as rollers, balls, lubricant or the like, in order to facilitate the tightening up of the socket. The screw-threaded ring 2 may in all cases be constructed in two or more parts: if it is formed of a single member it is pushed over the end of the spigot before the projection is formed.

In Figure 7 the screw-threaded ring is formed as a coupling nut 2 the internal diameter of which is greater than that of the projection 12 on the end 3 of the spigot. Consequently the coupling nut 2 may be integrally provided on the end 3 of the spigot at the place where the coupling is effected. A divided interposed ring 13, 13^1 is inserted between the projection 12 and the coupling nut 2; the latter presses with its projecting part 16 against a corresponding shoulder 57 on the interposed ring 13, 13^1 and so presses also against the projection 12 on the end 3 of the spigot, so that the latter is pressed against the bottom of the socket, which again at the same time compresses the packing 8. The interposed ring 13, 13^1 is provided with a centering extension 14 by which it is guided in the coupling nut 2 and also with a centering extension 15 by which it is guided in the socket 1. The interposed ring 13, 13^1 may be made in any suitable manner; for example it may be turned or pressed or cast or it may consist of sections of tubing with the shoulder upset. The coupling nut 2 is provided in known manner with grooves or holes 18 to enable it to be screwed in known manner. Between the flange 12 and the inner wall of the socket 1 an annular space 19 is left into which additional packing may be inserted when required. The annular space 19 is closed by a suitably shaped extension 20 of the interposed ring 13, 13^1. The extension 20 may, as shown in broken lines, extend over the flange 12 into the chamber provided for the packing 8 in order to allow for the admission of a larger quantity of packing corresponding to the space filled by the projection 20. The coupling nut 2 is provided with a surface 21 tapering in a direction towards the end of the spigot and the surface 22 tapering in a direction towards the end of the socket. The divided interposed ring 13, 13^1 is provided with a tapering surface 23. The reason for these surfaces tapering is to allow a tape or band of jute or wool felt to be easily wound tightly around the whole joint.

In Figure 8 the expansion shoulder 11 is cut off on the inside by the end 3 of the spigot. The tube 24 is capable of movement axially over the end 3 of the spigot within the limits a, a. The flange 9 is prevented from moving axially towards the bottom 25 of the socket by a divided distance ring 26. In order that the packing 8, which, when being inserted, is in front of the distance ring 26, does not become damaged, the distance ring 26 is provided with a sloping surface 27.

Figure 9 illustrates the same joint as

Figure 8, differing from the latter only in that the distance ring 26 is replaced by a second projection 28 on the end 3 of the spigot.

In Figures 10 to 12 the spigot and socket joint illustrated is provided to move on balls. The bottom 25 of the socket 1 and the end 29 of the spigot 3 which abuts against the bottom 25 of the socket are provided spherical. The projection 30 consists of a ring in two parts and is likewise spherical in shape on the side facing the divided interposed ring 13, 13¹. The side of the interposed ring 13, 13¹ which presses against the projection 30, is likewise spherical in shape. The coupling nut 2, which engages in a screw thread on the socket 1 presses with its extension 16 against a corresponding projection 17 on the interposed ring 13, 13¹ so that the end 3 of the spigot is prevented from axial movement. The forces which are disposed at right angles to the axis of the pipe and which emanate from the spherical face of the projection 30 are absorbed in that the interposed ring 13, 13¹ presses against the inner wall of the socket 1 and the pressure transmitting projection 17 dovetails into the extension 16 on the coupling nut 2. The interposed ring 13, 13¹ has a tapering surface at 31 with the slope in the direction of the spherical face so that acute angles are avoided which might easily lead to crushing: the projection 30 which is formed as a divided ring is held fast in position in the direction of the bottom 25 of the socket, for example the spigot is made double at 32 (Fig. 10) or is flanged at 33 (Figure 11) or the projection 30 is provided with an extension 34 (Figure 12). The end of the spigot 3 which abuts against the bottom 25 of the socket is formed spherically either by the double portion 35 (Figure 10) or by upsetting at 36 (Figure 11) or by flanging at 37 (Figure 12).

Figure 13 illustrates a construction for particularly high pressure necessary in hot steam pipes and in chemical processes. The socket 1 has particularly stout walls, while the end 3 of the spigot is strengthened by the doubled-over part 38 in the direction of the compression space for the packing 8. A metal ring which may be for example of copper and in the form of a smooth wedge is employed as packing. This metal ring is pressed by the coupling nut 2 over a flange 39 by the divided interposed ring 13, 13¹, so that a very high pressure can be produced in the compression space. The screw thread by means of which the coupling nut 2 is screwed on the socket 1 is particularly deep and may consist of a thread in the form of either a trapezium or a prism or a cord.

Figure 14 illustrates the method of producing the screw thread by means of rollers. The pipe is provided with its socket 1 pressed down on the mandrel head 40. The mandrel head 40 is rotatably mounted on the shaft 41 of the mandrel, for example in the use of pins 42 and ball bearings 43. The roller 33 is barrel-shaped at 45 and is provided with a screw-threaded groove 46 for rolling the thread. In carrying out the method the roller (or rollers) 44 move in the direction indicated by the arrow A, the roller or rollers and the pipe rotating simultaneously. The roller or rollers are driven and moved axially either by means of the pipe or by means of the roller or rollers. The barrel-shaped 45 of the roller or rollers has for its object to ensure that the irregularities of the surface of the socket, produced for example by the pressing of the socket mould and the complete screw thread mould, are rolled out. The screw thread mould and the pitch be as desired.

Figure 15 illustrates the preliminary pressing of the screw thread in the swage. The swage consists of the upper part 47 and the under part 48 and carries the socket mould 49 as well as the screw thread mould 50. The tube is inserted into the swage, the parts 47 and 48 of the swage are brought together and thereupon the mandrel 51 is forced into the tube so that the socket mould 1 is formed with the thread 52. A flange 53 on the mandrel 51 is used for upsetting the material of the blank for pressing out the screw thread. The burr which forms on the parts 47 and 48 of the swage where they meet is effected by rotating the socket 1 after the first pressing operation and after slightly raising the part 47 with the mandrel 51, for example through an angle of 45°. In this connection it is necessary for the screw thread 52 with the thread mould 50 of the swage to remain in engagement, that is to say, for the tube to be unscrewed through a corresponding fraction of the thread. For this purpose the part 50 of the swage extends beyond the screw-threaded part of the socket the predetermined distance 54.

Figure 16 illustrates the cutting of the screw thread. The thread cutting tool 55 has a barrel-shaped cutting part 56 or a cylindrical part 57 with a tapering part 58 for smoothing away the irregularities that may be present on the surface 59 of the socket 1 lying within the range of the screw thread. The pipe is mounted centrally on a mandrel (not shown in the

drawing).

The cutting of the screw thread in stages is illustrated in Figure 17. The sections of cutting tool 60, 61 and 62 are so divided that the section finally coming into engagement completes the shape of the screw thread. The sections are in this connection spaced apart the distance 63 which is equal to the pitch of the thread and they are disposed one behind the other. These spaces 63 are cylindrical in shape and are used for removing the burr if any is produced through the cutting in the hot state.

Figure 18 shows the screw thread cutter provided with a number of cutting sections disposed directly one behind the other by which it is possible completely to cut out the screw thread in one rotation of the socket.

Figures 19 to 23 indicate the application of the screw thread by means of a sleeve (known as "false socket") mounted in position. As shown in Figure 19, a sleeve 64 is mounted on the end 1 of the socket for producing the thickened part necessary for producing the thread 65. The sleeve 64 is with the end 1 of the socket converted into the shape of the socket. A weld seam 66 serves to prevent the sleeve 64 from moving axially in one direction while the shape of the socket prevents the sleeve 64 from slipping over the socket. Instead of the weld seam 66 a flange 67 (Figure 20) may be provided. Furthermore, as shown in Figure 21, the flange 67 may be supplemented by a weld seam 68 or a hole or spot weld 69, or both together. To enable the screw thread to be easily cut through the sleeve 64 is upset at 70 (Figure 22) at the base of the screw thread, or it may be strengthened in any other suitable manner. The sleeve 64 is inserted into the socket as shown in Figure 23.

Figure 24 and 25 illustrate the substitution of the screw thread by conical faces. The pressure on the interposed ring 13, 13^1 is obtained by pressing a two-piece coupling cap 71, 71^1 by the conical faces 72 against the socket 1 and/or by pressing a conical face 73 against the interposed ring 13, 13^1. The compression is obtained by screwing together the two parts 71, 71^1 of the cap by the screws 74 (Figure 25). Filling members 75 are employed for taking up irregularities in manufacture. The screw 74 may as shown in Figure 26 be replaced by wedges 76 which draw the two parts 71, 71^1 together.

Figure 27 illustrates a construction in which the interposed ring 13, 13^1 is replaced by a second flange 77 provided on the end of the spigot; in this case the projection 12 may as shown in Figure 28 be replaced by a ring 78.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A spigot and socket joint in which the ends of the tubes are held together by a screw-threaded ring provided on the end of the spigot and which engages in screw thread on the socket, characterised in that the screw-threaded ring presses against a projection on the end of the spigot which is formed by a swelling, doubling, a flanging or upsetting, and that the end of the spigot presses against the bottom of the socket for preventing axial movement and thus forms a hollow space shut off from the inside of the tube, in which hollow space packing is provided.

2. A modified construction of the spigot and socket joint according to claim 1, characterised in that a locking ring presses against the projection on the end of the spigot.

3. A spigot and socket joint according to claim 1 or claim 2, characterised by the provision of rollers, balls or the like for reducing friction, and provided between the projection and the screw-threaded ring or the locking ring.

4. A spigot and socket joint according to claims 1 to 3, characterised in that the screw-threaded ring is formed in two parts.

5. A spigot and socket joint according to claim 1, characterised in that the projection formed as a flange, against which the screw-threaded ring presses, is provided between the packing and the screw-threaded ring.

6. A spigot and socket joint according to claims 1 to 5, characterised by the provision of an expanding corrugation.

7. A spigot and socket joint according to claims 1 to 6, characterised by the provision of a coupling nut in the form of a screw-threaded ring.

8. A spigot and socket joint according to claims 1 to 7, characterised in that a compression space for the packing tapers in wedge formation towards the bottom of the socket.

9. A spigot and socket joint according to claims 1 to 3 and 5 to 8, characterised in that an undivided ring is used with an open end, that is greater than the projection on the end of the spigot the screw-threaded ring pressing through a divided interposed ring against the projection on the end of the spigot.

10. A spigot and socket joint according

to claim 9, characterised in that the interposed ring is provided with a centering extension by which it is guided in the screw-threaded ring.

11. A spigot and socket joint according to claims 9 and 10, characterised in that the interposed ring is provided with a centering extension by which it is guided in the socket.

12. A spigot and socket joint according to claim 9, characterised in that between the projection on the end of the spigot and the inner wall of the socket an annular space is left for the insertion of packing when this is effected subsequently, said hollow space being closed by a corresponding extension of the divided interposed ring.

13. A spigot and socket joint according to claim 12, characterised in that the extension is in the form of a centering extension.

14. A spigot and socket joint according to claims 12 and 13, characterised in that the extension projects beyond the breadth of the flange into the packing space.

15. A spigot and socket joint according to claim 9, characterised in that the screw-threaded ring or the coupling nut, and advantageously also the divided interposed ring are tapered off in such manner that there is a smooth transition from those parts to the tube for the purpose of subsequent insulation.

16. A spigot and socket joint according to claim 6, characterised in that an expanding shoulder provided on the end of the socket is covered by the end of the spigot, while the projection presses against the bottom of the socket by means of a divided distance ring.

17. A spigot and socket joint according to claim 16, characterised in that on the end of the spigot a second projection is provided in place of the distance ring.

18. A spigot and socket joint according to claim 16, characterised in that the distance ring is tapered off towards the flanged side of the end of the spigot in such manner that it does not disturb the packing which lies in front of it as it is being inserted.

19. A spigot and socket joint according to claims 16 to 18, characterised in that the body of the tube is capable of axial movement behind the expansion corrugation so that the covering always remains in place.

20. A spigot and socket joint according to claim 9, characterised in that the end of the spigot abutting against the bottom of the socket, and the bottom of the socket, the projection on the side facing the interposed ring, and the projection on the side of the interposed ring lying against the first-mentioned side, are formed spherically.

21. A spigot and socket joint according to claim 20, characterised in that the end of the spigot abutting against the bottom of the socket is formed spherically by flanging, doubling, upsetting and the like.

22. A spigot and socket joint according to claim 20, characterised in that the projection is formed as a divided ring and is held in position in the direction of the bottom of the socket.

23. A spigot and socket joint according to claims 20 to 22, characterised in that the divided interposed ring on the pressure transmission extension dovetails into the coupling nut and presses against the inner wall of the socket.

24. A spigot and socket joint according to claim 23, characterised in that the interposed ring tapers towards the spherical face in order to avoid acute angles.

25. A spigot and socket joint according to claim 9, for use with a high pressure in hot steam pipes and in chemical processes, characterised in that the walls of the compression space for the packing are thickened by doubling the end of the spigot on the inner side of the tube.

26. A spigot and socket joint according to claims 1 to 25, characterised in that packing consists of bituminous products either with or without fibrous substances or hemp packing, or flax and graphite packings, or packings of hemp or vegetable fibre soaked in oil, or metallic and non-metallic wool, asbestos and the like, or paper or the like, which may all be in the form of rope.

27. A method of producing screw thread on spigot and socket joints according to claims 1 to 26, particularly with sockets of steel, characterised by rolling the thread in the metal in the same heat as that in which the socket mould is pressed.

28. Apparatus for carrying out the method according to claim 27, characterised in that one or more of the screw-threaded rollers of a section corresponding to the pitch and shape of the thread, and working in the compound metal are barrel shaped.

29. Apparatus according to claim 28, characterised in that a mandrel head used for pressing the socket mould acts as abutment for rolling the thread and is mounted so as to be capable of rotation.

30. Apparatus according to claims 28 and 29, characterised in that the drive for the rolling and the movement in the axial direction are effected by means of the tube or the rollers.

31. A method of producing screw thread on spigot and socket joints, according to claim 27, characterised in that the thread is pre-pressed in the swage.

32. A method according to claim 31, characterised in that the socket is pressed a second time after the first pressing in a position which is staggered, for example by 45°, with respect to the position taken during the first working operation.

33. Apparatus for carrying out the process according to claim 31 or claim 32, characterised in that the swages contain at one and the same time socket and screwthread moulds, and that the part of the swage which contains the screw thread extends beyond the thread of the socket.

34. Apparatus according to claim 33, characterised in that the mandrel is formed with a flange for upsetting blanks for the complete pressing of the screw thread.

35. A method according to claim 27, characterised in that the screw thread is previously milled in the hot state.

36. Apparatus for carrying out the process according to claim 35, characterised in that the screw-threaded cutting tool is provided with the cutting part of barrel shape or as a cylinder with a tapering surface for smoothing purposes.

37. A method according to claim 35, characterised in that the screw thread is cut in steps.

38. The apparatus for carrying out the process according to claim 37, characterised in that the cutting sections are divided up step wise and are provided one behind the other while maintaining a distance apart equal to the pitch of the screw thread, cylindrical parts being provided between the sections for removing any burr.

39. A method according to claim 35, characterised in that the screw thread is completely milled during one rotation of the socket.

40. Apparatus comprising a sleeve (known as a "false socket") applied upon the socket on screw-threaded spigot and socket joints according to claims 1 to 39, for producing the thickened part necessary for the screw thread.

41. A spigot and socket joint according to claim 40, characterised in that the sleeve is welded to the tube for example on the end faces of the sleeve or by hole or spot welding.

42. A spigot and socket joint according to claims 40 and 41, characterised in that the sleeve is prevented from making axial movement by a flange formed on the tube.

43. A spigot and socket joint according to claims 40 to 42, characterised in that the sleeve on the seat of the thread is upset for the simple cutting through of the thread.

44. A modification of the construction of screw-threaded spigot and socket joint according to claims 40 to 43, characterised in that the sleeve is enclosed within the socket.

45. A spigot and socket joint according to claim 1, characterised in that a two-part coupling cap presses with conical faces against the socket and/or against a two part interposed ring, or against a flange on the end of the spigot in such manner that upon the two parts of the cap being drawn together by means of screws or wedges the compression force is exerted on the ends of the tube.

46. A spigot and socket joint substantially as hereinbefore described and illustrated in the drawings.

Dated this 29th day of November, 1934.
EDWARD EVANS & CO.,
27, Chancery Lane, London, W.C.2,
Agents for the Applicant.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1936.

Fig. 1

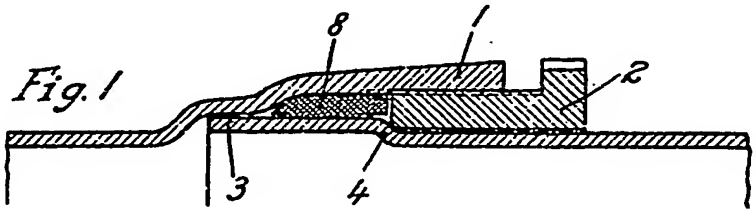


Fig. 2

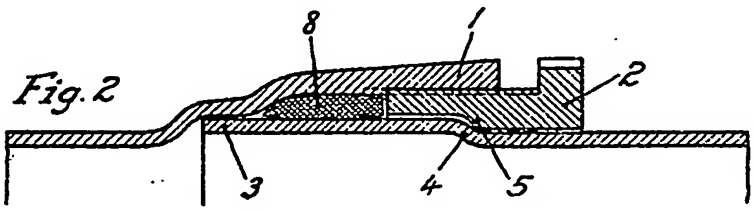
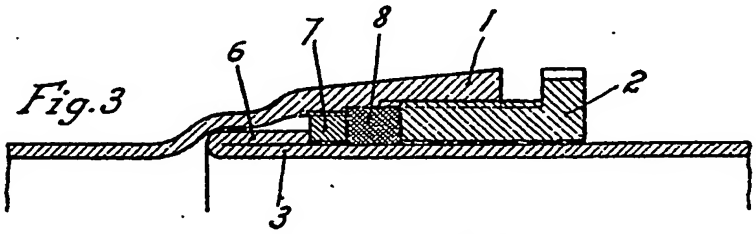


Fig. 3



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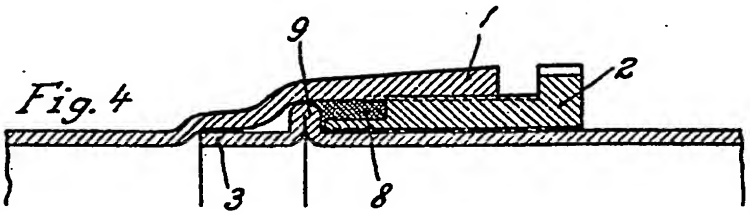

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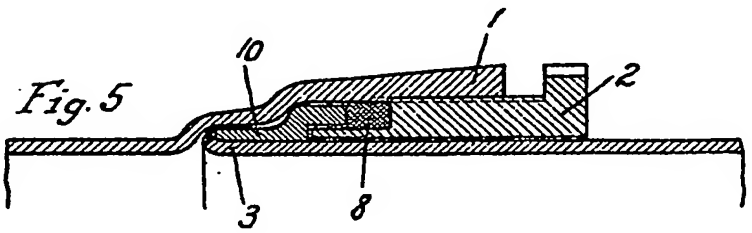

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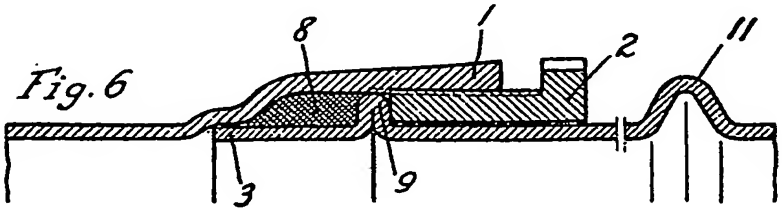

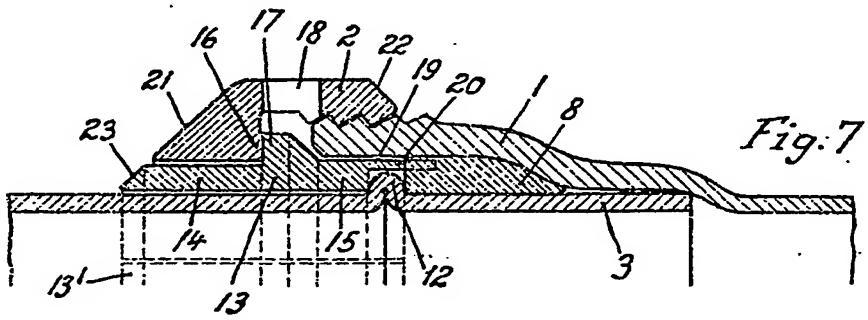

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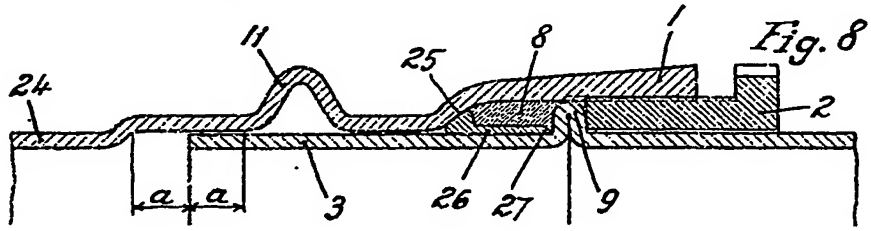

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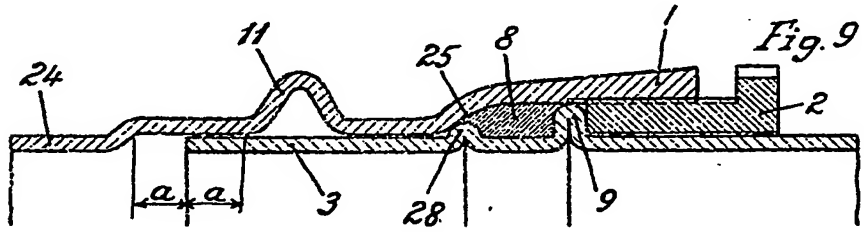

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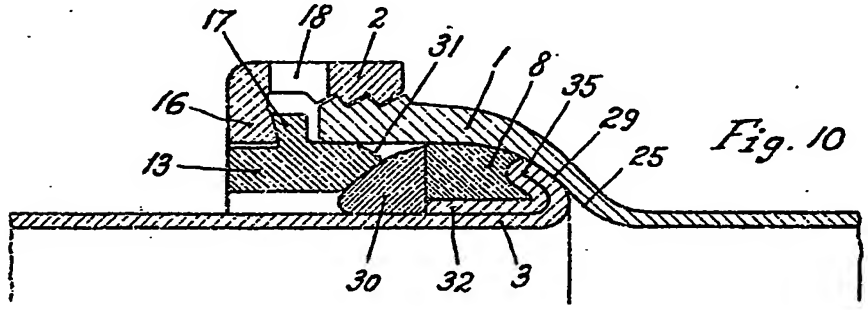

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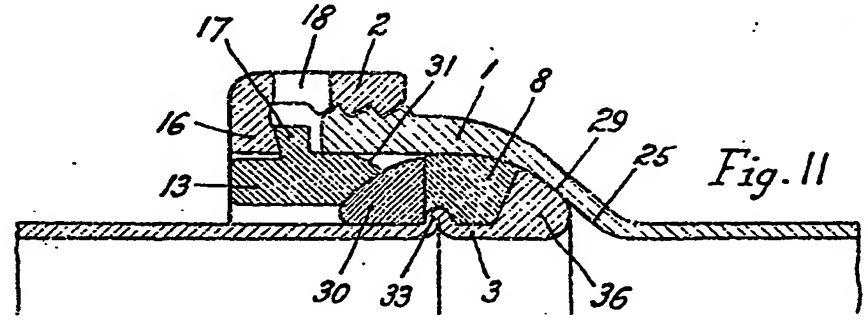

Fig. 11

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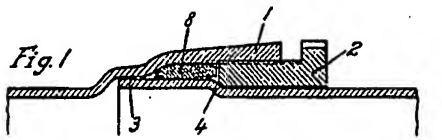

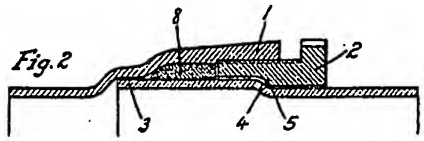

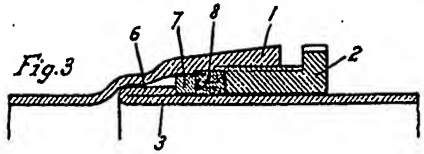

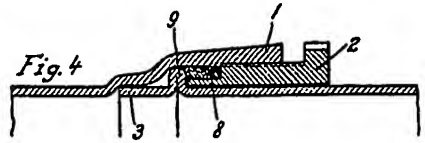

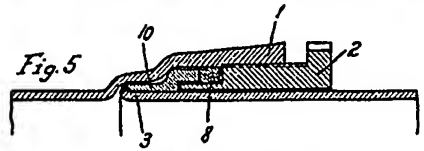

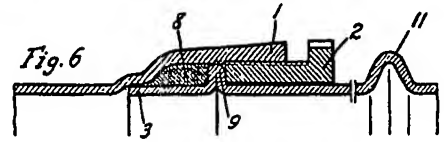

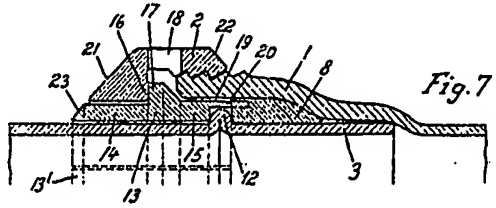

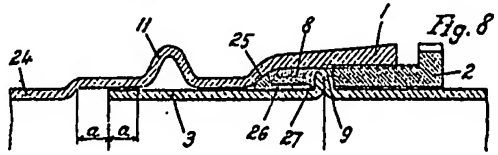

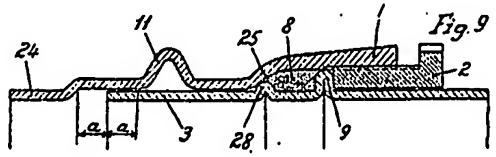

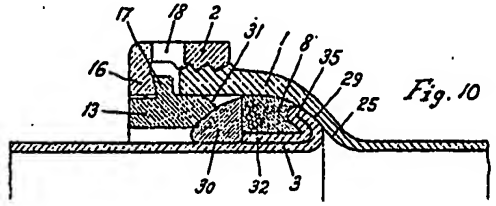

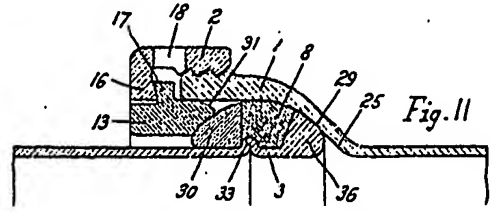

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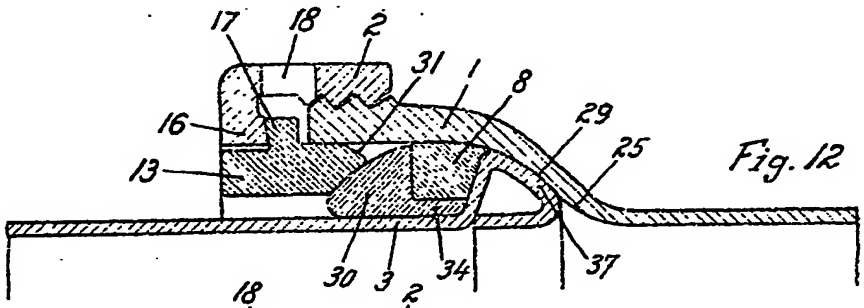


Fig. 12

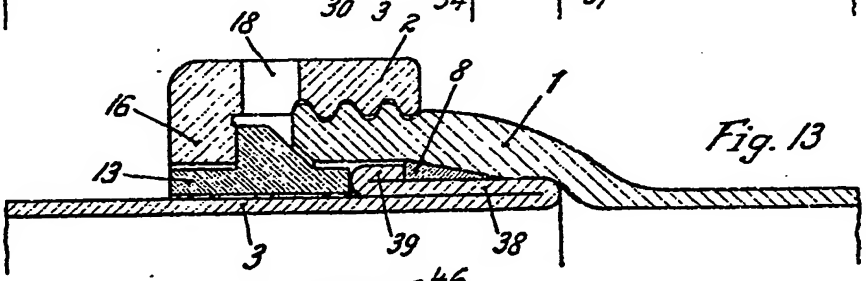
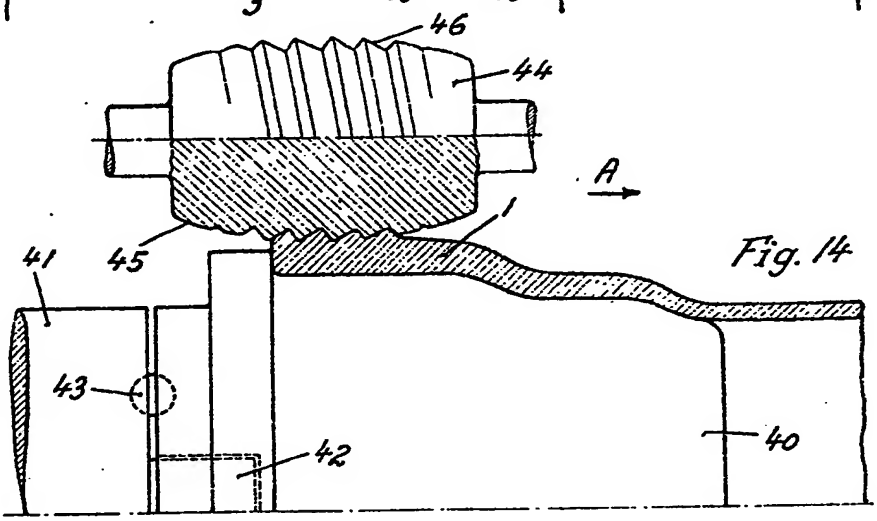


Fig. 13



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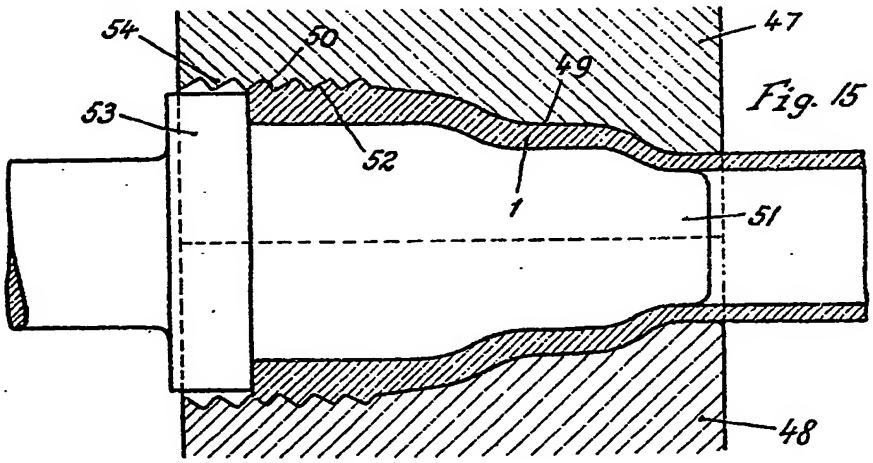

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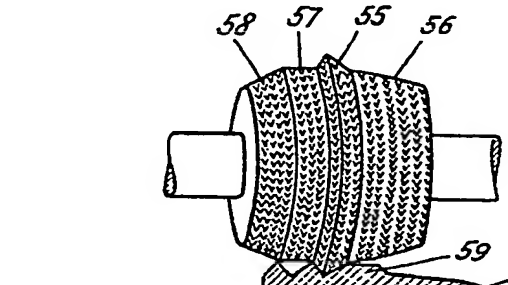
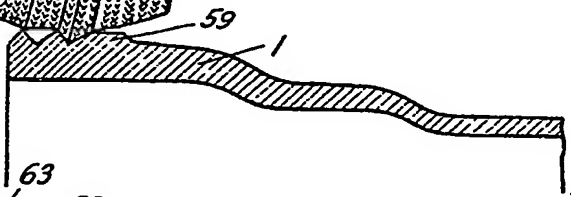


Fig. 16



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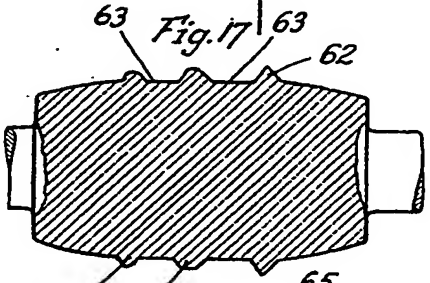

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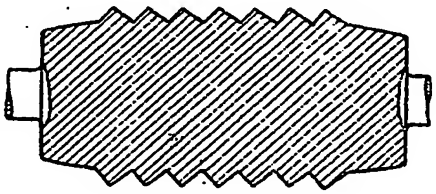

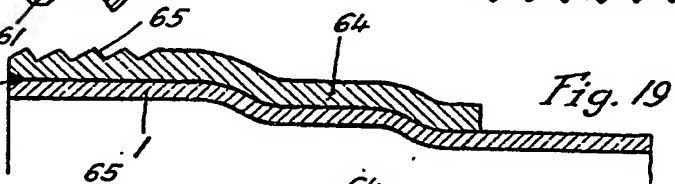

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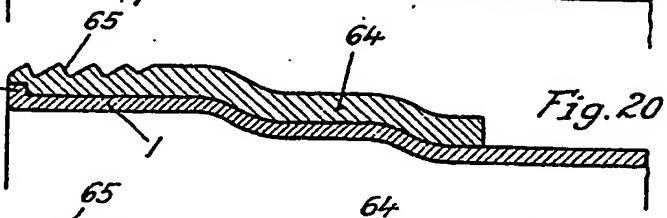

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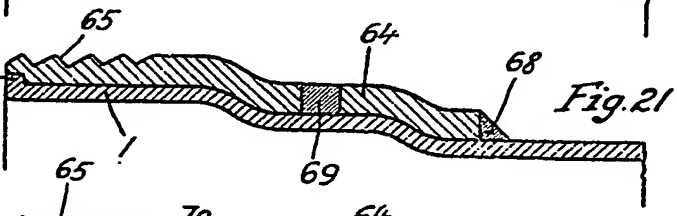

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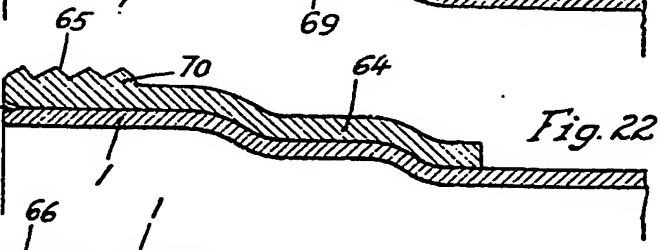

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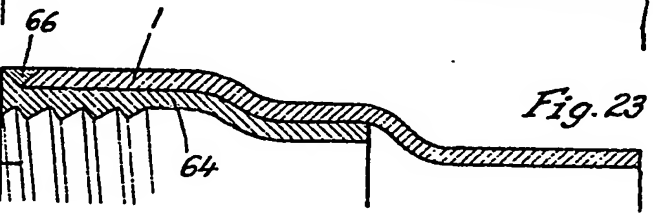

Fig. 23

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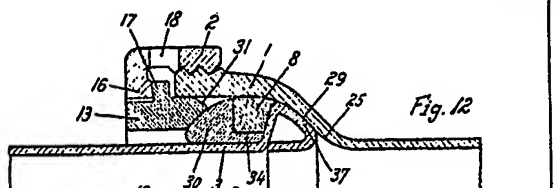

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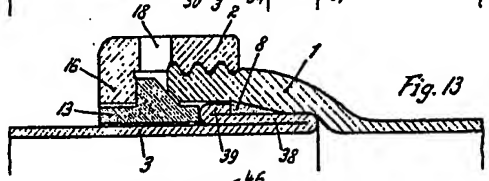

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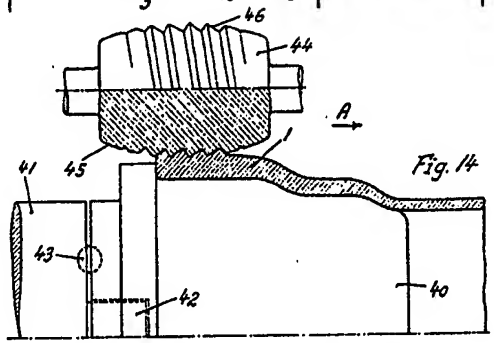

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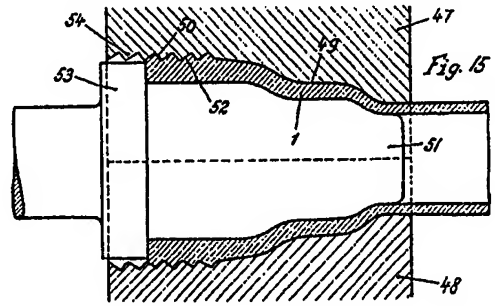

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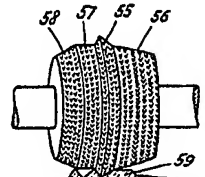

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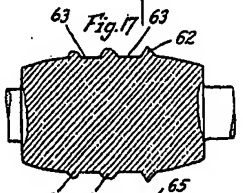

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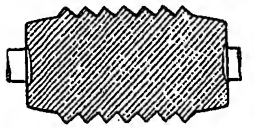

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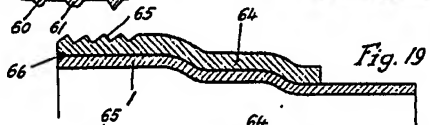

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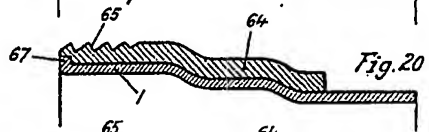

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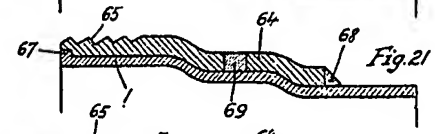

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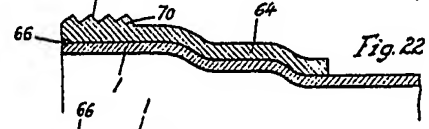

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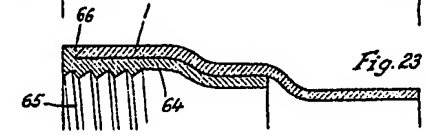

Fig. 23

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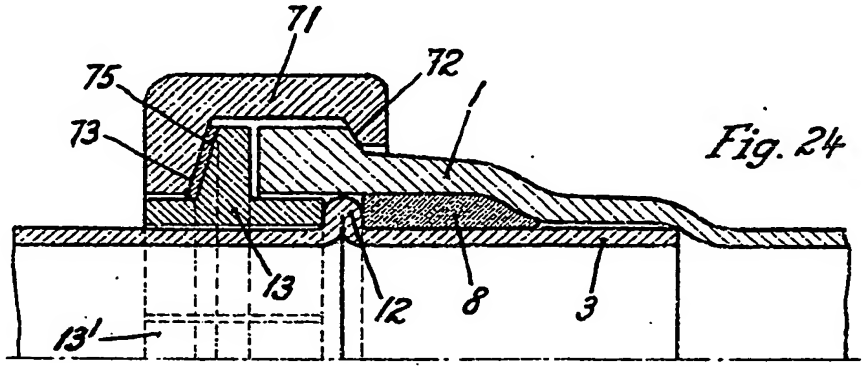

Fig. 24

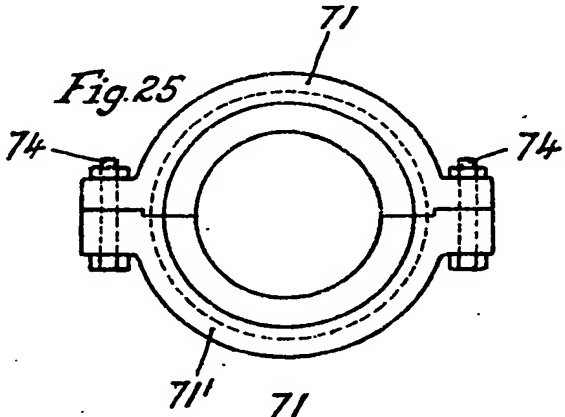

Fig. 25

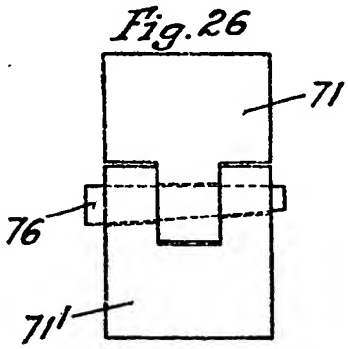

Fig. 26

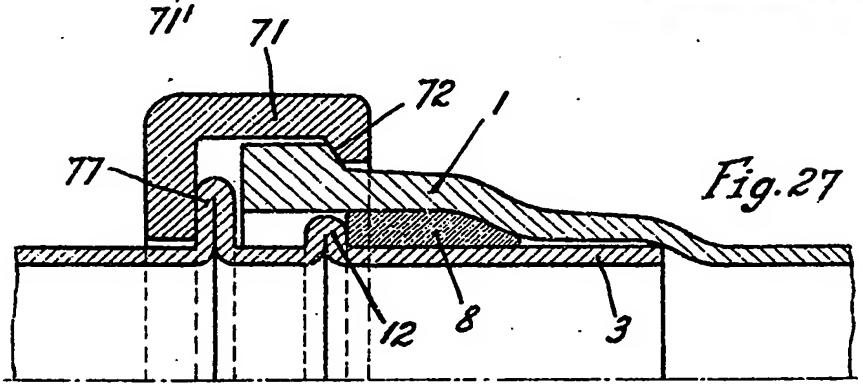

Fig. 27

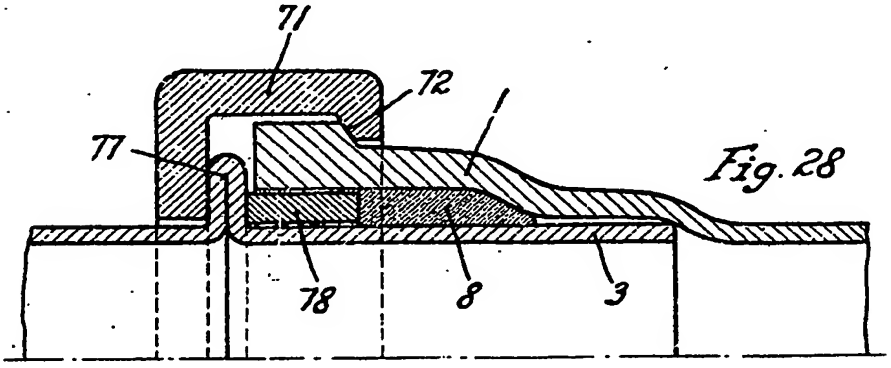

Fig. 28

Malby & Sons, Photo-Lith.